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ABSTRACT

Electronic books, often electronic versions of popular children's illustrated books, have the same words and illustrations as their printed versions, but also can read aloud individual words, phrases, and stories, can pronounce individual syllables in a word, and can provide animated clues to word meanings by animating and labeling selected objects in the book's illustrations. Fifteen third grade children participated in this study. Six unfamiliar vocabulary words were selected from the poem, "My Incredible Headache," in the CD ROM book entitled, "The New Kid on the Block" (Prelutsky, 1993). Children were given both a pretest and posttest, in which they were asked to define the unfamiliar words. After the pretest, each child listened as the computer read the poem. After each passage was read, the child was asked to watch the animation as the researcher clicked on unfamiliar words. The child was then asked to define the word. The posttest was given four days after interaction with the poem. Results indicate that when children are required to attend to the animated clues, the clues facilitated learning for most of the children--all but one child made gains from the pretest to the posttest. The animated clues seemed to be equally effective across all of the target words. (SWC)

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Faculty Released Time Project Final Report
Fall Semester 1997

The Effects of Animation Cues on Third Grade Children's Ability to Learn the Meanings of Unfamiliar Words

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Electronic books are an integral part of reading programs in many schools today. These books are often electronic versions of popular children's illustrated books. The electronic books have the same words and illustrations as the printed books, but they have additional features not available in the printed books. The electronic books can read aloud individual words, phrases and stories, can pronounce individual syllables in a word, and can provide animated clues to word meanings. The electronic books can animate and label selected objects in the books illustrations. For example, early Discis books such as *Thomas's Snow Suit* and *Mud Puddle* can be set to have the computer pronounce a selected word, then give a definition of the word and finally add the word to a recall list of selected words. Objects in the Discis book illustrations are labeled when the user selects them. For example, when the user points to and clicks on a character in an illustration the character's name is displayed or if the user selects a snowsuit hanging in a closet, the computer superimposes the word 'snowsuit' on the snowsuit in the illustration.

The newer Living Books series published by Broderbund introduced animation into electronic books. The very popular *Just Grandma and Me* (Mayer, 1993) designed for very young children reads a passage from the story then allows the user to click on words and objects in the illustration. When the user selects a word the computer reads the word aloud. When the user clicks on an object in an illustration the object becomes animated. For example, when the user selects the mailbox in one of the illustrations, the mailbox door opens and a frog jumps out. Other books in the Living Books series such *as The New Kid on the Block* (Prelutsky, 1993), provide animated sequences for selected words and phrases in the text. For example, when the user clicks on the word **Bawl**, in Prelutsky's poem My Baby Brother, a baby in the accompanying illustration cries loudly. In the words of the publisher, "The 'Let Me Play' mode lets students click on various words or phrases, activating a series of animations that define (often in a hilarious way) the meaning of the word or phrase" (Boderbund, 1998). Do these features of electronic books facilitate learning to read? Do children or teachers use the features? If so, who learns what under which conditions?

Previous Research

Very few investigators have studied the influence of specific electronic book features on reading achievement. Several investigators have sought to compare the effects of electronic and print books on reading achievement (Matthew, 1997; Moore & Smith, 1996 and Standish, 1992). Matthew (1997) obtained mixed results when she compared Third Grade children's reading achievement when using electronic or print versions of the same book. She reported that children who read Discis electronic books performed significantly better on story retelling than a matched group who read printed books, but there were no differences between the two groups on a story comprehension test. Matthew does not report how the story retellings differed between the two groups, nor does she explain which features of the electronic books may have contributed to the

differences. No efforts were made to monitor the children using the electronic books to determine which features of the book they used or how frequently they used them.

Moore and Smith (1996) compared the differences between electronic books and printed books on Fourth Grade children's performance on story comprehension tests. A three way repeated measures ANOVA (Print vs. CD ROM X Short-Easy Story vs. Long Difficult Story X Male vs. Female) revealed a significant interaction between the book format and the difficulty level of the story indicating that the CD ROM format was more effective when stories were long and difficult. Again, the authors provide no explanation of how specific electronic book features may have contributed to the differences in story comprehension, though they do acknowledge that the novelty of the CD ROM format may have been a contributing factor. Furthermore, the authors suggest that text manipulation in electronic books should be controlled in future studies indicating that it was suspected of being a contributing factor to the results in their study.

Standish (1992) compared the reading achievement of two unequally matched groups of Second Grade children; one group reading CD ROM books the other reading printed books. A simple MANOVA revealed no differences between the two group's scores on the Metropolitan Achievement Test (MAT). Unlike previous researchers cited, Standish did monitor the children's use of the electronic book features. She had the children record in reading journals unfamiliar words they encountered in their stories. She also had the children define each unfamiliar word and use it in a sentence. She did not report the extent to which children in each group were able to identify unfamiliar words, nor did she relate their use of the electronic book features to their reading achievement. While the features of the electronic books may have contributed to the growth of the children's vocabularies, this growth was not likely to be detected with a standardized reading test such as the MAT.

None of these studies report the extent to which children use the electronic book features that were available to them. Even in those comparison studies that report significant differences in reading achievement favoring electronic books, no efforts were made to determine if or how those features contributed to reading achievement. The novelty of the electronic books is a reasonable explanation for the differences observed in each of the studies that matched groups of children CD ROM or Print book treatments.

This study was designed to determine if the animated cues found in the Living Books facilitate learning the meanings of unfamiliar words. To avoid the problems generally associated with two matched pair groups, the children in this study served as their own controls. To ensure that children attended to the animated clues in the electronic book, the researcher worked individually with each child on the computer. The problem then was to determine whether or not these animated clues presented in the electronic book facilitate learning the meanings of unfamiliar words.

Method

Participants

An intact class of 21 Third Grade children from an upper middle class suburban elementary school in the northeast was selected to participate in the study. Four children missed the pretest because they were participating in a special pull-out program. Two of the children were absent on the day the posttest was administered. The absent children's pretest scores were not included in the matched-pairs analysis for obvious reasons. The 15 children who took both the pretest and posttest served as their own controls in a matched-pairs analysis of the differences between their two scores. There were 10 girls and 5 boys.

Electronic Materials and Equipment

The electronic book titled *The New Kid on the Block* (Prelutsky, 1993) was used to present 6 unfamiliar vocabulary words in this study. *The New Kid on the Block* is a collection of poems written by Jack Prelutsky published as a CD ROM in the Living Books series by Broderbund. Like most books in the Living Books series, when a word is selected (the user clicks on the word) the computer pronounces the word aloud then a brief animation related to word is displayed. For example, when the user clicks on the word Locomotive in the poem, *My Incredible Headache*, two train engines are displayed banging into the sides of a character's head.

The New Kid on the Block CD ROM disc was displayed on an IBM 365X notebook computer. The computer has a device located in the middle of the keyboard that is use to point an arrow at words and objects on the computer screen. Right and left buttons at the bottom of the keyboard are used to select words or objects that have been pointed to. The pointing device is different from the mouse that is commonly used for pointing and selecting with school computers, for this reason the researcher controlled the pointer.

Assessment Materials

Six words selected from the poem, *My Incredible Headache*, were the target words to be learned in this study. The target words were **Temples, Locomotives, Vise, Regiments, Bongos,** and **Plumbing.** The 6 target words were identified as unfamiliar to a large percentage of Third Grade children in an earlier study. The unfamiliarity of the words ranged from 73 percent (Regiments) to 46 percent (Vise) where the percentage represents the proportion of children who were unable to state the meaning of the words when used in the poem. The target words were presented orally by the researcher. The target words were embedded in sentences used in the poem, for example, "The word is **vise**. My head is being squeezed in a ***vise***."

Procedures

The researcher worked with children individually in the hallway outside their classroom. For the Pretest each child was asked to define six unfamiliar words from the poem *My Incredible Headache* when presented in sentences taken from the poem. If the child gave a correct definition, a "C" was entered into a record sheet. If the child gave an incorrect

definition, an "I" was entered. If the child was not able give a definition, an "N" was entered.

Immediately after the pretest, each child listened as the computer read the poem. After each passage was read the child was asked to watch the animation as the researcher clicked on the unfamiliar words. The child was then asked to define the word. If the child gave a correct definition the correctness of the definition was confirmed by the researcher. If the child gave too general a response she or he was prompted to be more specific, for example, if the child said, "Part of a train." for the word Locomotive, she was asked "Which part of the train." If the child gave an incorrect definition she was told that the response was incorrect and that she could try another word, a correct definition was not given. If the child could give no definition, the experimenter indicated that she could try another word.

Four days after interacting with the poem, the children were given a delayed posttest to determine how many of the unfamiliar words they could correctly define. The same procedures used to present and score the pretest were used to present and score the posttest.

Results

The individual children's pretest and posttest scores are displayed in Table 1. All but one of the children made gains from the pretest to the posttest. One child, MT, scored 2.00 on both pretest and posttest. Individual pretest to posttest gains ranged from a low of 2.00 (LM) to a high of 6.00 (AC). Ten of the 15 children scored 85 percent or more on the posttest correctly defining 5 or more of the 6 target words.

Fewer than 4 of the 15 children were able to define the words Temples, Locomotives, Plumbing, Regiments and Vise on the Pretest, thus confirming the unfamiliarity of those words. The word, Bongos, was more familiar being correctly defined by 10 of the 15 children when presented in the sentence, "Someone keeps drumming on bongos."

The difficulty level of the unfamiliar words dropped markedly on the posttest. The number of students correctly defining the words ranged from 10 of 15 for Temples and Plumbing to 14 of 15 for Bongos. The average difficulty level of the words was 11.5 on the posttest vs. 3.1 on the pretest.

Table 1. Children's Pretest and Posttest Scores

Child	Pretest	Posttest
PR(F)	1.00	4.00
AG(F)	0.00	3.00
SR(F)	4.00	6.00
LM(F)	0.00	2.00
KK(M)	1.00	5.00
CJ(F)	0.00	5.00
DD(M)	1.00	5.00
BF(M)	2.00	6.00
KF(F)	1.00	4.00
MT(F)	2.00	2.00
AC(M)	0.00	6.00
AK(F)	2.00	6.00
AP(F)	2.00	6.00
MW(M)	3.00	6.00
ES(F)	0.00	5.00

The Mean Pretest and Posttest scores and their standard deviations (SD) are presented in Table 2. The Mean gain from the Pretest (1.27) to the Posttest (4.73) was 3.43. A Mean gain of 3.43 represents 58 percent of the possible 6.00 posttest score. The correlation of Pretest and Posttest scores was .41 with a significance level of .13.

Table 2. Pretest Posttest Descriptive Statistics

Group	Mean	N	SD	Std. Error b
Pretest	1.27	15	1.22	.32
Posttest	4.73	15	1.44	.37

The results of a Wilcoxon Matched-Pairs Signed-Ranks Test are presented in Table 3. The analysis of the ranks of the matched Pretest - Posttest scores produced a Z value of –3.2958, which is significant at the 0.001 confidence level.

Figure 3. Pretest and Posttest Signed-Ranks Comparisons

Mean Rank	Cases	
7.50	14	- Ranks (Pretest less than Posttest)
.00	0	+ Ranks (Pretest greater than Posttest)
	1	Ties (Pretest equals Posttest)
	--	
	15	Total

Z = -3.2958 2-Tailed P = .0010

Discussion

Do the animation cues in the New Kid on the Block facilitate the learning of unfamiliar words? The results of this study indicate that when children are required to attend to the animated clues, the clues facilitated learning for most of the children. Only one of the 15 children did not make a gain in her pretest to posttest performance. Those who made gains averaged 3.43 out of a possible 6.00. Further more, the animated clues seemed to be equally effective across all of the target words. An analysis of the individual word scores on the posttest indicated that the difficulty levels of the words ranged from .66 to .93. While the individual animations may have been more effective for some children than others, none of the animations could be considered ineffective. Perhaps attention should be directed at how to use the animation sequences more effectively with children.

The purpose of this study was to determine if the animated clues alone enabled the children to learning the meanings of unfamiliar words, therefore, very little interaction between the researcher and the children occurred. The interactions were limited to directing the children to attend to the animated clues associated with the target words or phrases that included the target words. Perhaps if there were a greater degree of interaction between the child and an adult the meanings of the target words might be better learned and retained. These interactions might involve such things as having the children correctly define the words prior to advancing in the poem, using the words in conversation, or making distinctions between the target words and similar words. For example, when children clicked on the word **Regiments** in the poem My Incredible Headache, animated combat boots marched across the screen. Some children thought the word referred to a marching band. When the researcher directed the children to select the phrase containing the word **Regiments**, helmeted soldiers with rifles marched across the screen. An adult familiar with the program can use the animated clues to point out the differences between a group of soldiers and a group of musicians. An adult can also engage the children in conversation that includes the target words. Repeated use of the target words in conversation and clarifying the distinction between the target words and words with different meanings may assist children in learning and retaining the meanings of the target vocabulary words.

Teachers and parents may use the Living Books knowing that children can learn the meanings of unfamiliar words, if they attend to the animation features of the books. It remains to be seen if the children will use the animation features without the minimal participation of an adult as was provided in this study. As the producer (Broderbund, 1998) noted, the animations themselves are often entertaining as well as informative. It is quite possible that children will use the animated clues for their intrinsic entertainment value without the need to employ an extrinsic incentive such as points towards a course grade. On the other hand, it is not known if the entertainment aspects of the animations will override their word defining qualities without minimal adult participation in the learning process.

Although the differences between the children's pretest and posttest scores were statistically significant, there is still room for improvement. Only 6 of the 15 children, 40

percent, were able to define all 6 of the unfamiliar words in *My Incredible Headache*. That means that there is room for 60 percent of the children to raise their scores on the posttest. Additional research directed at learning how teachers, parents and the children themselves can use the animated sequences in the Living Books more effectively will enable this technology to deliver on the promise of improved learning for all children

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Memorandum

To: Dr. James Tate, Chair
Long Range Planning Committee

From: Norman Higgins

Re: Fall Semester 1997 Released Time Project

Copy: Kathryn Padovano, Dean
School of Education

The report of my study on the effectiveness of animated cues on learning the meanings of unfamiliar words is attached. I worked with Mrs. Patricia Cox and her Third Grade students in conducting this study.

I plan to prepare a manuscript suitable for publication and submit it to either the Journal of Research on Computing in Education or Educational Technology Research and Development.

I greatly appreciate the support from the Long Range Planning Committee and the administration of Dowling College for my research activities.